

I claim:

1. A filter comprising:

a. a cartridge comprising:

5 i. first and second end plates at a predetermined distance apart, at least the first end plate having a central opening therethrough;

ii. a center tube between the first and second end plates including a wall that defines at least one hole through; and

10 iii. a plurality of posts extending between and secured to the end plates;

b. a flexible screen having at least one first wrap around the center tube and at least one second wrap around the posts; and

c. means for removeably holding the at least one screen second wrap against the posts.

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2. The filter of claim 1 wherein:

a. The end plates and posts form a cage; and

b. the center tube is captured and is free to move inside the cage.

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3. The filter of claim 1 wherein the end plates, center tube, and posts are integral with each other.

25 4. The filter of claim 1 wherein the means for removeably holding the at least one screen second wrap comprises at least one elastic band surrounding the screen second wrap and holding the at least one screen second wrap against the posts.

30 5. The filter of claim 1 wherein the screen has a first end that is laid against the center tube, and a second end that is a free end on the outside of the at least one screen second wrap.

35 6. The filter of claim 1 wherein the screen has opposed longitudinal edges that are spaced apart slightly less than the predetermined distance.

7. The filter of claim 1 wherein the screen has a mesh with approximately .06 inch openings.

8. Apparatus for filtering a fluid comprising:

a. a cage comprising:

i. a pair of end plates spaced a predetermined distance apart, at least one end plate having a central opening therethrough; and

ii. at least three posts extending between and secured to the end plates;

b. a center tube captured in the cage and having a wall that defines at least one hole therethrough;

c. a screen having a first end laid against the center tube and a second end, the screen being wrapped with at least one first wrap around the center tube and with at least one second wrap around the posts, the screen second end being alongside the at least one second wrap; and

d. means for holding the screen at least one second wrap against the posts.

9. The apparatus of claim 8 wherein the end plates, posts, and center tube are integral with each other.

10. The apparatus of claim 8 wherein the center tube is free to rotate inside the cage.

11. The apparatus of claim 8 wherein the screen is comprised of a fiberglass mesh having openings of approximately .06 inches.

12. The apparatus of claim 8 wherein the screen has opposed longitudinal edges that are spaced apart slightly less than the predetermined distance.

13. The apparatus of claim 8 wherein the means for holding the screen comprises at least one elastic band surrounding the at least one second wrap.

14. The apparatus of claim 8 wherein the screen comprises a connecting section between the at least one first wrap and the at least one second wrap.

15. In combination with a pump having a chamber with an open end and a fluid inlet passage to the chamber; a sealing ring removeably sealed to the chamber open end and having an outlet passage; and means for pumping fluid through the inlet passage to the chamber and out the sealing ring outlet passage,

a two-sage filter insertable into and removable from the pump chamber comprising:

a. a cartridge comprising a center tube having a

foraminous wall, and a plurality of posts each secured to two spaced apart end plates having respective central openings and cooperating with the posts to capture the center tube between the end plates and posts;

5 b. a screen having at least one first wrap around the center tube and at least one second wrap around the posts; and

 c. means for holding the at least one second wrap around the posts,

10 so that a fluid pumped through the inlet passage to the chamber flows through the filter at least one second wrap, through the at least one first wrap, and through the center tube wall to the sealing ring outlet passage.

16. The combination of claim 15 wherein:

15 a. the pump further has a locating piece in the chamber; and

 b. the locator piece has a pilot that fits in the central opening of one of the filter cartridge end plates.

20 17. The combination of claim 15 wherein the sealing ring has a pilot that fits within the central opening of one of the cartridge end plates.

 18. The combination of claim 15 wherein the center tube is free to move inside the posts and end plates.

 19. The combination of claim 15 wherein cartridge end plates, center tube, and posts are integral with each other.

25 20. The combination of claim 15 wherein the screen comprises a connecting section between the at least one first and second wraps.

21. The combination of claim 15 wherein:

 a. the cartridge end plates are at a predetermined distance apart; and

30 b. the screen has opposed longitudinal edges that are spaced apart a distance slightly less than the predetermined distance.

35 22. The combination of claim 15 wherein the end plates are rectangular in shape, and wherein there are four posts secured to the end plates.

 23. The combination of claim 15 wherein the means for holding the screen comprises multiple elastic bands surrounding and pressing the at least one second wrap against the posts.

24. A method of assembling a filter comprising the steps of:

- a. providing a pair of end plates;
- b. securing the end plates to each other at a predetermined distance apart to multiple posts;
- 5 c. capturing a foraminous center tube between the end plates and the posts;
- d. wrapping the screen with at least one inner wrap around the center tube;
- e. wrapping the screen with at least one outer wrap around
- 10 the posts; and
- f. holding the at least one outer wrap against the posts.

25. The method of claim 24 wherein the step of providing a pair of end plates comprises the step of providing at least one end plate with a central opening therethrough.

15 26. The method of claim 24 wherein the steps of securing the end plates to each other and capturing a foraminous center tube comprises the steps of making the end plates, center tube, and posts integral with each other.

20 27. The method of claim 24 wherein the step of capturing a center tube comprises the step of capturing the center tube to freely move relative to the posts and end plates.

28. The method of claim 27 wherein the step of wrapping the screen with at least one inner wrap comprises the steps of:

25 a. laying a first end of the screen against the center tube; and

b. rotating the tube relative to the posts and end plates at least one turn and thereby wrapping the screen with at least one wrap on the center tube.

30 29. The method of claim 24 wherein the step of wrapping the screen with at least one inner wrap comprises the steps of:

a. feeding a first end of the screen between two posts toward the center tube and thereby pulling a screen running end between the two posts;

35 b. laying the screen first end against the center tube; and

c. wrapping the screen with at least one full inner wrap around the center tube and thereby further pulling the screen running end between the posts.

30. The method of claim 29 wherein the step of wrapping the screen with at least one inner wrap comprises the step of rotating the center tube relative to the posts.

5 31. The method of claim 29 wherein the step of wrapping the screen with at least one outer wrap comprises the step of:

 a. wrapping the screen running end around the posts with at least one full wrap; and

 b. providing a connecting section on the screen between
10 the at least one inner and outer wraps.

32. The method of claim 24 wherein the step of holding the at least one outer wrap comprises the step of surrounding and pressing the at least one outer wrap against the posts.

15 33. A method of filtering a liquid comprising the steps of:

 a. providing a chamber having a inlet passage and an open end;

 b. sealing the chamber open end with a sealing ring having
20 an outlet;

 c. providing a two-stage filter comprising the steps of;
 i. capturing a center tube having a foraminous wall between two end plates each secured to opposed ends of multiple posts;

25 ii. wrapping a flexible screen with at least one inner wrap around the center tube;

 iii. wrapping the flexible screen with at least one outer wrap around the posts; and

30 iv. surrounding and holding the at least one outer wrap against the posts;

 d. inserting the filter into the chamber; and

 e. flowing liquid through the inlet passage to the chamber, through the filter, and out the sealing ring outlet.

35 34. The method of claim 33 wherein the step of capturing a center tube comprises the step of enabling the center tube to move freely between the end plates and the posts.

35. The method of claim 33 wherein the step of capturing a center tube comprises the step of forming the end plates, posts, and center tube integral with each other.

5 36. The method of claim 33 wherein the step of wrapping a flexible screen with at least one inner wrap comprises the steps of:

 a. laying a first end of the screen against the center tube; and

10 b. rotating the center tube relative to the end plates and posts with at least one full turn and thereby wrapping the screen around the center tube with at least one full inner wrap.

37. The method of claim 36 wherein the step of wrapping the flexible screen with at least one outer wrap comprises the steps of:

15 a. pulling a screen running end between two posts in response to turning the center tube; and

 b. wrapping the screen running end around the posts with at least one full outer wrap.

20 38. The method of claim 37 comprising the further step of providing a connecting section in the flexible screen between the at least one inner and outer wraps.

39. The method of claim 33 comprising the further steps of:

25 a. removing the filter from the chamber;

 b. unwrapping the at least one outer and inner wraps of the screen from the posts and center tube, respectively;

 c. cleaning the screen;

30 d. re-wrapping the at least one inner and outer wraps around the center tube and posts, respectively;

 e. surrounding and holding the at least one outer wrap against the posts; and

 f. inserting the filter back into the chamber.

35 40. The method of claim 33 wherein the step of flowing liquid through the filter comprises the step of flowing water through the filter at least one outer wrap in a first stage, through the filter at least one inner wrap in a second stage, and through the center tube wall to a center tube interior to the sealing ring outlet.